

# KamLAND Calibration LED Array

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Calibration of the KamLAND detector is a vital aspect of the experiment. The primary means of obtaining the relative timing of the PMTs will be through deployment of light sources in the center of the detector. Because it plays such a critical role for the experiment, a second means of verifying the calibration is desirable. Several fast-pulsing, blue LED devices have been designed for installation near the PMTs to assist in the time calibration. GaN LEDs<sup>1</sup> with an average wavelength of 470 nm are used to obtain a good match with the spectral response of the PMTs.

A single LED will illuminate a patch of PMTs on the opposite side of the detector. Because the location of the LED will be fixed and well surveyed, we will be able to determine the relative timing of the illuminated PMTs. By having several LEDs fairly evenly spaced around the detector, it is expected that there will be overlapping patches which will allow us to tie the calibration of all of the PMTs together. Also, in the event of a failure of an LED, calibration of the PMTs illuminated would still be possible using other LEDs in the vicinity.

The LED devices consists of a LED mounted to a triggering circuit board. The intensity of the LED is controllable through a driving voltage, and the LED is fired on the leading edge of a TTL pulse. The driving voltages and a trigger signal supplied externally from detector electronics. The LEDs can be triggered at a rate of a few kHz, and a light pulse of about  $7ns$  FWHM is produced. The LED with its circuit board are potted in a black acrylic housing with an acrylic window. A neutral density filter has also been installed to better control the light output.

Other applications within the KamLAND experiment are being considered for these LEDs. In addition to the array of LEDs at the PMTs, it is anticipated that devices using the same LEDs and circuit boards, but with different illumination patterns would be placed on key locations of the

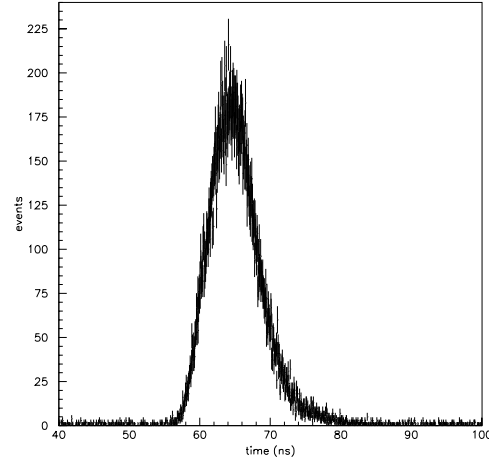


Figure 1: Figure shows the pulse width distribution for one of the LED devices.

calibration source deployment mechanism. By pulsing these when the sources are deployed, we will be able to get a quick cross check on the position of the calibration hardware. The LEDs may also be used for calibration of the veto counter.

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## Footnotes and References

<sup>1</sup>Nichia High Power Blue LED, NSPB520S.